

Attachment 3.2-3

**Section 4.10 (Biological Resources)
from**

Environmental Assessment

**Prepared by U.S. Bureau of Reclamation Before
Renewal of Delta-Mendota Canal Contract**

SECTION 4.10: BIOLOGICAL RESOURCES

This section discusses the potential effects that the alternatives considered in Chapter 2 would have on biological resources in the Delta-Mendota Canal Unit. The project area is located in portions of San Joaquin, Stanislaus, Merced, and Fresno Counties. In the project area, a variety of vegetation types and wildlife resources could potentially be affected by the long-term contract renewals. In addition, special-status species that may occur in the project area are also identified.

Baseline information on biological resources, including special-status species and their habitats, in the Delta-Mendota Canal Unit project area was compiled primarily from existing literature and information gathered from water district general managers and staff. Data sources included the CVPIA Draft PEIS (Reclamation, 1997a), Draft EA for Eastside/Westside Water Transfer/Exchange (Tetra Tech, 2000), Draft Biological Opinion on Operation of the CVP and Implementation of the CVPIA (Reclamation and Service, 2000), A Guide to Wildlife Habitats of California (Mayer and Laudenslayer, 1988), and vegetation categories derived from CALVEG data (Matyas and Parker, 1980). Additional data sources used for identifying the presence or absence of special-status species included the California Fish and Game Natural Diversity Database and California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California.

AFFECTED ENVIRONMENT

Historically, the region surrounding the Delta-Mendota Canal Unit contained a diverse and productive patchwork of aquatic, wetland, riparian forest, and surrounding terrestrial habitats that supported abundant populations of resident and migratory species of wildlife (Tetra Tech, 2000). Huge herds of pronghorn, tule elk, and mule deer grazed the prairies, and large flocks of waterfowl occurred in the extensive wetlands. The major natural plant communities included grasslands, vernal pools, marshes, and riparian forests.

Today, land uses in the region, including agricultural, residential, and M&I uses, have converted land from native habitats to cultivated fields, grazing, homes, water impoundments, flood control structures, and other developments. Most of the species that occurred historically in the region remain in these same areas, although at lower than historical numbers. Because of the reduction in the acres of habitat available to these species, remnants of habitats such as wetlands and riparian forests are increasingly valuable.

Historical fishery resources within the project area were different from the fishery resources present today (Reclamation, 1997a). Many native species have declined in

abundance and distribution, and several introduced species have become well established. The major factors producing changes in aquatic habitat within the project area are habitat modification, species introduction, and overfishing of fishery resources that originate in the project area. These factors and anthropogenic activities within the project area have adversely affected the fisheries resources in the area.

AQUATIC HABITAT AND FISH

Streams that make up the aquatic habitats within the project area are typically small intermittent streams that drain the Coast Ranges but rarely reach the San Joaquin River. On the east side, three major tributaries of the San Joaquin River drain the western Sierra Nevada and provide flow to the San Joaquin River. These tributaries, the Stanislaus, Tuolumne, and Merced Rivers, are located east of the project area and provide habitat, spawning, and rearing for salmonids. Impoundments on each of these rivers provide flood control, irrigation, and power generation. The lower San Joaquin River flows east of the project area.

Historically, the upper reaches of the San Joaquin River and its tributaries have provided habitat for chinook salmon and steelhead trout. Spring-run chinook historically used the upper reaches of the San Joaquin River, but was extirpated when Friant Dam was completed in 1949. Spring-run chinook was probably eliminated by 1930 from the Stanislaus, Tuolumne, and Merced Rivers as a result of the construction of water storage facilities. Both fall-run chinook salmon and steelhead trout continue to use these tributaries; their returns have been low for a number of years. The Merced River Fish Hatchery, operated by California Department of Fish and Game, produces fall-run chinook salmon. This facility is the only salmon production facility located within the San Joaquin River basin.

Little information exists about fishery resources in water bodies located within the project area. The intermittent streams located within the project area are not known to support anadromous fish and are unlikely to support populations of resident fish because of the hydrologic conditions. The numerous water conveyance facilities, water supply, and drainage canals could support warm-water fish, such as bass, crappie, sunfish, bullhead, and Sacramento sucker, and various minnow species such as Sacramento pikeminnow (formerly squawfish).

The two fish species of greatest concern in the San Joaquin basin are briefly described below. Common and scientific names of fish species cited in this document are provided in Appendix B.

Fall-Run Chinook Salmon

Populations of fall-run chinook salmon have persisted within the San Joaquin River basin, although greatly reduced since the 1940s. The populations have varied in size and are limited to habitat located downstream of the major dams on the Stanislaus, Tuolumne, and Merced Rivers. Barriers to adult migration include low stream flow and low dissolved oxygen levels in the lower San Joaquin River and south Sacramento-San Joaquin River Delta (Delta) channels. These water quality conditions have contributed to low returns of adults to upstream spawning habitats. The current population trends indicate considerable annual variability in escapement levels of fall-run chinook salmon in the Stanislaus, Tuolumne, and Merced Rivers. Typically, escapements have been proportional to the spring-runoff years, with high returns observed following high spring flows and small returns following drier runoff years.

Adult fall-run chinook salmon migrate through the Delta and into Central Valley rivers from July through December and spawn from October through December. Peak spawning usually takes place in October and November with egg incubation beginning in October and extending to mid-May during some years. Chinook salmon fry (juveniles less than 2 inches long) generally emerge from December through March, with peak emergence by the end of January. Generally, fry emigrate from December through March and smolt (young salmon about two years old and at the developmental stage when they assume an adult's silvery color) emigrate from April through June. A small proportion of the population emigrates as yearlings from October through December.

Two major movements of juvenile fall-run chinook salmon into the Delta estuary have been identified. The first group of fry begin entering the estuary in January, with peak abundance occurring in February and March; fry abundance in the Delta increases following high winter flows. The second group and later emigration of smolts occurs from April through June. This group of fry continues rearing in the upper estuary and emigrates as smolts during the normal smolt emigration period. Smolts reared in upstream habitat migrate quickly through the Delta and Suisun and San Pablo Bays.

Steelhead Trout

Similar to chinook salmon, the physical habitat for steelhead trout spawning has been greatly reduced within the project area. Steelhead trout spawn in the upper reaches of some of the San Joaquin River tributaries and rear for a year or more before emigrating to the Delta estuary. Water quality conditions including elevated water temperatures and agricultural return flows containing pesticides and salts adversely affect survival of juvenile steelhead trout.

Factors Affecting Abundance

The total basin outflow has been reduced as a result of the construction and operation of impoundment facilities located on the San Joaquin River and its tributaries. In addition, water quality has been substantially altered by pesticides and salts from agricultural drainage. Reduced flows in the San Joaquin River and high exports from Delta water diversions have reduced the survival of juvenile salmonids in the San Joaquin River. These conditions have combined to adversely affect anadromous fisheries, particularly in the south Delta region. Salmon straying into west-side canals, small and medium-sized diversions, elevated water temperatures, channel dredging, waste discharges, and low dissolved oxygen concentrations also adversely affect anadromous fisheries resources (Reynolds et al., 1993). Factors such as water diversions, inadequate or nonexistent screening facilities, and barriers to fish migration adversely affect salmon and steelhead production.

Upstream Migration. For many years, attraction flows from the Merced River have proved inadequate during October, resulting in straying of adult salmonids into agricultural drainage ditches. Barriers (electrical and physical) were installed across the San Joaquin River upstream of the Merced River confluence in 1992 to prevent salmon migration into these sloughs and help guide the salmon into the Merced River.

Low dissolved oxygen concentrations (less than 5 mg/L) and high water temperatures (greater than 66°F) in the San Joaquin River near Stockton delayed or blocked the migration of adult salmonids during the 1960s (Hallock et al., 1970). Since 1964, fall migration problems have been reduced by improved wastewater treatment and installation of a physical barrier at the head of Old River in dry years to direct most of the San Joaquin flows down the main channel past the city of Stockton. Despite these efforts, low dissolved oxygen concentrations continue to occur during drought conditions.

Spawning. Chinook salmon and steelhead trout use the San Joaquin River and its tributaries as migration corridors to stream reaches that provide spawning habitat in the Stanislaus, Tuolumne, and Merced Rivers. Water temperatures below major reservoirs in the San Joaquin River tributaries frequently do not permit successful spawning of fall-run chinook salmon until November. Although spawning habitat does not appear to be limiting recovery of fall-run chinook salmon stocks in the San Joaquin River Basin, spawning gravel restoration might be needed in the future to offset gravel depletions below dams and to provide sufficient spawning habitat to accommodate future adult populations.

Juvenile Rearing. Streamflow has been identified as the primary factor affecting the abundance of chinook salmon stocks in the San Joaquin River Basin. Streamflow

reductions after April and May in the Merced and Tuolumne Rivers result in poor survival conditions for chinook salmon juveniles that remain in these tributaries beyond these months. High mortality generally results from reduced living space, high water temperatures, and increased predation. Current interim instream flow requirements in the Stanislaus River provide adequate flow conditions through the chinook salmon rearing period.

Generally, water temperatures below major dams on the San Joaquin River tributaries become unsuitable for chinook salmon rearing in May or June, causing high mortality of juvenile chinook salmon that have not emigrated. However, in the Stanislaus River, releases of cold hypolimnetic water from New Melones Reservoir have improved water temperatures during the late spring rearing period relative to preimpoundment conditions (Reclamation, 1986).

Selenium in agricultural drainage water poses a potential risk to juvenile chinook salmon in the San Joaquin River. Selenium is directly toxic to fish at elevated levels in the water column and through bioaccumulation in body tissues. Growth and survival of juvenile chinook salmon are adversely affected by exposure to dissolved and dietary selenium. However, harmful levels have not been detected in the major rearing areas of the San Joaquin River and its tributaries (CDFG, 1987).

Juvenile Emigration. Spring flows in the San Joaquin River and major tributaries during the chinook salmon emigration period appear to have a major influence on the number of adults returning to the San Joaquin River Basin. Positive correlations exist between spring flows in the San Joaquin River and total fall-run chinook salmon spawning escapement 2.5 years later. Smolts emigrating in the San Joaquin River and through the southern Delta frequently encounter low flows, high temperatures, and high diversion rates. Proposed spring outflow recommendations for the Merced, Tuolumne, and Stanislaus Rivers are designed to improve survival of juvenile salmon emigrating down the tributaries the mainstem of the San Joaquin River and through the Delta.

Declining streamflow during the spring emigration period of fall-run chinook salmon coincides with rising air temperatures and increased agricultural return flows to the San Joaquin River, often resulting in rising water temperatures along much of the emigration route in the lower San Joaquin River. During May, water in the San Joaquin River near Vernalis often reaches temperatures greater than 67.6°F at flows of 5,000 cubic feet per second or less. Under these conditions, up to half the production of San Joaquin River chinook salmon can be subjected to harmful water temperatures (CDFG, 1987).

Delta Flows and Exports. Data indicate that pumping by the CVP and SWP export facilities in the south Delta has a major impact on the survival of emigrating juvenile chinook salmon. High juvenile mortality in the lower San Joaquin River and Delta is associated with low spring outflows and corresponding increases in the proportion of San Joaquin River flow diverted by CVP and SWP export facilities. At low San Joaquin River flow, high diversion rates increase the proportion of San Joaquin River flow drawn toward the SWP and CVP facilities via Old River. Juvenile salmon diverted with the flow experience reduced survival associated with increased migration time, high water temperatures, predation, entrainment in unscreened agricultural diversions, and Delta export pumping. Maximum survival benefits could result from reduced exports, increased San Joaquin flows, and a barrier at the head of Old River during the spring emigration period (Service, 1993).

VEGETATION TYPES, HABITATS, AND WILDLIFE

The natural terrestrial community types associated with the project area are grassland, valley foothill riparian, alkali desert scrub, and fresh emergent wetlands. Agricultural communities within the project area are very diversified, and almost half of the irrigated acreage in the San Joaquin region is planted with grains, hay, and pasture (Reclamation, 1997a). Orchards are planted on about 30 percent of the irrigated acres; cotton and vegetables are each planted on about 10 percent.

The following discussion describes vegetation types, plants, and animals located in and adjacent to the project area. Common and scientific names of plants and animals are provided in Appendix B.

Grassland

Grassland vegetation is characterized by a predominance of annual or perennial grasses in an area with few or no trees and shrubs. Annual grasses found in grassland vegetation include wild oats, soft chess, ripgut grass, medusa head, wild barley, red brome, and slender fescue. Perennial grasses found in grassland vegetation are purple needlegrass, Idaho fescue, and California oatgrass. Forbs commonly encountered in grassland vegetation include long-beaked filaree, redstem filaree, dove weed, clovers, Mariposa lilies, popcornflower, and California poppy. Vernal pools found in small depressions with an underlying impermeable layer are isolated wetlands within grassland vegetation.

Grassland habitats are important foraging areas for black-shouldered kite, red-tailed hawk, Swainson's hawk, northern harrier, American kestrel, yellow-billed magpie, loggerhead shrike, savannah sparrow, American pipit, mourning dove, Brewer's blackbird, red-winged blackbird, and a variety of swallows. Birds such as killdeer, ring-necked pheasant, western

kingbird, western meadowlark, and horned lark nest in grassland habitats. Grasslands also provide important foraging habitat for the coyote and badger because this habitat supports large populations of small prey species, such as the deer mouse, California vole, pocket gopher, and California ground squirrel. Common reptiles and amphibians of grassland habitats include western fence lizard, common kingsnake, western rattlesnake, gopher snake, common garter snake, western toad, and western spadefoot toad.

Valley Foothill Riparian

Valley foothill riparian vegetation occurs in valleys and bottomlands bordered by gently sloping alluvial fans and dissected terraces and coastal plains. Valley foothill riparian vegetation generally consists of woodlands or forests of broad-leaved deciduous hardwood trees as the overstory, with a variety of shrubs and vines composing the midstory, and a few grass and forb species and vines composing the understory. The floodplains of valley foothill riparian communities are usually well-developed. Fluvial processes such as flooding, with its resulting sediment deposition and bank erosion, create three characteristic riparian landforms: gravel point bars, low terraces, and high terraces. Each landform has a different hydrology because of its physical relationship to the aquifer and flooding.

Gravel Bar. Gravel bar habitats are subject to seasonal flooding and are sensitive to changes in flow volumes, timing, and rates of change in flow volumes. High spring flows and low summer flows often keep gravel bar plant communities from developing.

Willow scrub and willow-cottonwood forests develop on gravel bars. Willow scrub vegetation is the “pioneering” vegetation on point bars, creek edges, canal slough banks, and low river terraces. Dense thickets of one or more willow species (e.g., sandbar, red, arroyo, and black willow) develop on point bars and creek edges. Dense willow thickets, which contain small amounts of cottonwood, white alder, and mule fat with occasional interior live oak and elderberry along the upper edges, develop on canal slough banks and low river terraces. Willow-cottonwood forests form dense sapling stands or forests to 60 feet in height. Black willow, arroyo willow, and cottonwood dominate the canopy. Older stands typically have a midstory of willows and box elder or thickets of California wild grape, blackberries, and poison oak. Herbaceous vegetation can be sparse or dense and includes species such as cocklebur, mugwort, umbrella-sedge, and horseweeds.

Because willow scrub habitat frequently grows in dense clumps, it offers cover to a variety of wildlife species. Beaver preferentially feed on young willow shoots, and many small birds and mammals feed on willow seeds. Willows support an abundance of insect prey that feed on fresh foliage and stems during the growing season. These insects, in turn,

support a high density and diversity of migratory and resident insectivorous birds, including the western flycatcher, yellow warbler, MacGillivray's warbler, Wilson's warbler, and song sparrow. Some species have declined or been eliminated from the valley floor as nesting species, among them the willow flycatcher, yellow warbler, and yellow-breasted chat.

Species that forage on seeds and foliage in scrub and herb habitats along creeks and rivers include the California ground squirrel, Botta's pocket gopher, California vole, California quail, mourning dove, European starling, American goldfinch, and Brewer's blackbird. Aquatic areas within the river channels also provide foraging habitat for carnivores and omnivores such as river otter, common merganser, common goldeneye, and a variety of gulls. Ground insectivores of the gravel bar riparian community include the western fence lizard, killdeer, spotted sandpiper, western kingbird, and broad-footed mole. Vertebrate predators include the gopher snake, red-tailed hawk, and striped skunk. Unvegetated vertical banks along the rivers provide nesting substrates for a variety of specially adapted species. The bank swallow, belted kingfisher, and northern rough-winged swallow depend on vertical banks for nesting, and a few other species such as common barn owls and burrowing owls will also nest in these habitats.

Low Terrace. Low terrace habitats develop as sediment accumulates on gravel bars. Communities of this habitat are sensitive to floodplain water-level fluctuations and changes in flood intensity or duration. These communities are typically inundated only during flood flows. Three plant communities develop on low terrace sites: mature cottonwood riparian forest, mixed riparian herb/scrub, and alder-willow forests. Mature cottonwood forests develop from young-growth willow-cottonwood forests. Forest heights can exceed 100 feet with a canopy of cottonwood or cottonwood-black willow. California wild grape or mistletoe may also occur in the canopy. A midstory of black willow, box elder, Oregon ash, and Northern California black walnut is typical of stands not dominated by California wild grape, a dense herb-vine that often forms an impenetrable understory. Large trees in these forests provide habitat elements required by several wildlife species. Cottonwood trees provide adequate nesting support for larger birds such as hawks, owls, American crow, great egret, and great blue heron. Cavity-nesting species such as woodpeckers, wood ducks, bats, western gray squirrel, raccoon, and ringtail require mature stands.

The mixed riparian herb/scrub community is located on riverbanks, berms, and terraces; occupying sites where disturbance from levee maintenance and farming practices prevent mature riparian forests from developing. Herbaceous dominants include weedy annual grasses, sedges, rushes, and numerous forbs such as horsetails, mustards, and thistles. The

scrub layer consists of shrub, vine, and tree saplings of willow, mule fat, blackberries, California wild grape, California wild rose, box elder, Fremont cottonwood, and Oregon ash. The mixed riparian herb/scrub community provides a variety of resources used by wildlife. Common wildlife species in mixed riparian herb/scrub communities include those dependent on nectar, fruit, and seeds, such as Anna's hummingbird, scrub jay, black-headed grosbeak, lazuli bunting, rufous-sided towhee, house finch, Virginia opossum, raccoon, striped skunk, and gray fox. The mixed scrub habitat also supports many of the insectivorous bird species that occur in willow scrub habitat.

Alder-willow forests are primarily associated with canals, sloughs, streams, and channelized rivers where steep gravel, rock, or riprap banks extend to a shoreline defined by sustained summer water levels. Alder-willow forests typically form narrow bands along the shoreline that often overhang the water. White alder, arroyo willow, black willow, and red willow, with some Fremont cottonwood and Oregon ash dominate the 10- to 40-foot-tall canopy. The typically narrow, linear nature of the alder-willow forest favors forms of wildlife that forage in adjacent herb-dominated communities or agricultural habitats, including black-shouldered kite, American kestrel, and western kingbird. It also provides perches and cover for species that forage in or over water, including double-crested cormorant, green-backed heron, belted kingfisher, violet-green swallow, tree swallow, black phoebe, beaver, river otter, and various bat species.

High Terrace. High terrace habitats are inundated only during peak storm runoff events and are not subject to severe physical battering or erosion (aside from bank erosion) or long-term flooding. Mixed riparian forest and valley oak riparian forest typify high terrace riparian communities.

Lush, multilayered 150-foot-tall gallery forests characterize this community. The canopy includes Fremont cottonwood, western sycamore, Oregon ash, Northern California black walnut, and valley oak. Midstories include black willow, box elder, and young trees of canopy species. Shrub understories often include impenetrable vine thickets of California wild grape, blackberries, poison oak, California wild rose, and California pipestem clematis. These vines drape over the midstory and canopy layers, imparting a junglelike appearance. Herb layers are typically dense.

Mixed riparian forests support the most dense and diverse wildlife communities in the Central Valley. The diversity of plant species and growth forms provides a variety of foods and microhabitat conditions for wildlife. Wildlife present include most of the species that occur in cottonwood forest and riparian scrub habitats. Oaks, walnuts, and

other mast-producing trees support certain species that do not occur in the other habitats, such as acorn woodpeckers, plain titmouse, and white-breasted nuthatch.

Valley oak riparian forests develop on the highest terraces where flooding is least frequent and short in duration. They are the rarest community in the Central Valley relative to their original extent. Valley oak riparian forest develops from mixed riparian forests where dense California wild grapevines have not prevented establishment of oak seedlings. The sparse to dense canopy consists of valley oak occasionally interspersed with Northern California black walnut. The sparse midstory consists of tree saplings, California wild grape, poison oak, blue elderberry, and blackberries. A lush grass or sedge-dominated herbaceous layer is typical.

Valley oak riparian forests provide nesting sites for red-tailed hawk, Swainson's hawk, and herons and egrets that require sturdy nesting sites and an open canopy for easy nest access. Valley oak stands also provide the best habitat for the acorn woodpecker, plain titmouse, and western gray squirrel. The open oak canopy provides perch sites for aerial foraging species such as the Lewis' woodpecker, ash-throated flycatcher, and western wood-peewee. It also offers perch sites for species that search for prey on the ground, such as the western bluebird and northern flicker. The furrowed bark on older oaks provides foraging habitat for species such as the Nuttall's woodpecker and white-breasted nuthatch that probe and peck for insects. Older trees provide an abundance of holes for cavity-dependent species.

Alkali Desert Scrub

Alkali desert scrub is generally characterized by a dominance of chenopods (members of the *Chenopodiaceae* family) or other halophytes, and exists in two distinct phases: xerophytic (drought-tolerant plants) and halophytic (salt-tolerant plants). In the project area, alkali desert scrub plant communities occur at low elevations in the western San Joaquin Valley.

The xerophytic phase is represented by open stands of widely spaced, low (0.8 foot) to moderately high (7 feet) grayish, spiny, and small-leaved shrubs and subshrubs. Allscale, fourwing saltbush, Parry saltbush, shadscale, and big saltbush are common shrubby saltbush species of this phase. Other important shrubs include bud sagebrush, Nevada tea, Fremont dalea, and creosote bush. Cheesebush, alkali goldenbush, and honeysweet tidestromia are common subshrubs in this phase. Forbs and grasses that characterize this phase include Torrey blazing star, kidney-leaved buckwheat, and apricot globemallow.

Closely spaced, not very woody, and more or less succulent plants that tolerate periodic flooding characterize the halophytic phase. This phase generally does not exceed a height of 3.3 feet. Common shrub and subshrubs found in this phase include arrow weed, greasewood, alkali goldenbush, kochia, iodine bush, and alkali rubber rabbitbrush. Common forbs and grasses are alkali heath, alkali weed, alkali heliotrope, arrow-grass, yerba mansa, and alkali sacaton.

Common birds that forage or nest in alkali desert scrub include roadrunner, mourning dove, blue-gray gnatcatcher, common raven, sage sparrow, white-crowned sparrow, house finch, American goldfinch, and lesser goldfinch. Common mammals include pocket gopher, California ground squirrel, desert cottontail, deer mouse, California vole, Heermann's kangaroo rat, black-tailed hare, striped skunk, badger, and coyote. Reptiles, such as side-blotched lizard, western whiptail, western fence lizard, gopher snake, and western rattlesnake, are commonly observed in alkali desert scrub habitat.

Fresh Emergent Wetlands

Freshwater emergent wetlands are characterized by the presence of erect, rooted, herbaceous plants that require, or are tolerant of, saturated or flooded soils. The community is intolerant of quickly flowing water, water depths exceeding five feet, rapid or wide fluctuations in water level, and saltwater. This community is restricted to ponds, canals, sloughs, river backwaters, and similar habitats. Freshwater emergent wetlands in the Central Valley are dominated by dense growths of tules and cattails, with occasional verbena, smartweed, rose-mallow (California hibiscus), and various rush and sedge species.

Freshwater emergent wetlands of the project area provide important habitat for waterfowl and a variety of other wildlife species, including grebes, herons, egrets, bitterns, coots, shorebirds, rails, hawks, owls, muskrat, raccoon, opossum, and beaver. Many other upland species such as ring-necked pheasant, California quail, black-tailed hare, and desert cottontail take cover and forage at the margins of wetland habitats. Many reptiles and amphibians such as common garter snake, aquatic garter snake, Pacific treefrog, and bullfrog also breed and feed in freshwater wetlands.

Vernal Pools

Vernal pools are seasonal wetlands that are unique to the Mediterranean climate region of California and northwestern Baja California and are most abundant in the Central Valley. Vernal pools develop in shallow basins that form in flat to hummocky terrain. Soil durapans underlying the basins prevent water infiltration and the nearly level terrain inhibits surface water runoff. Vernal pools are important communities because of their

current scarcity. Holland (1978) estimated that 5 to 30 percent of California's vernal pools are intact today; the figure for the Central Valley is about 5 percent.

Vernal pools support an ephemeral flora dominated by terrestrial annual species, with perennial and aquatic species often contributing substantial cover. Vernal pool species flower throughout the spring, resulting in conspicuous zonation patterns formed by consecutively blooming species around drying pool margins. Characteristic dominant plants include popcornflower, low barley, downingia, coyote-thistle, goldfields, meadowfoam, owl's clover, pogogyne, woolly marbles, and navarretia.

Although vernal pools are an ephemeral aquatic habitat, invertebrates and amphibians have adapted to this environment. When standing water is available, California tiger salamanders, western spadefoot toads, and Pacific treefrogs may use the pools for egg-laying and for the development of young. Aquatic invertebrates, such as fairy shrimp, tadpole shrimp, clam shrimp, cladocerans, copepods, and crawling water beetles, also inhabit vernal pools. In winter and spring, water birds such as mallards, cinnamon teal, killdeer, California gulls, green-backed herons, great blue herons, and great egrets use vernal pools for resting and foraging grounds. Western kingbirds, black phoebes, and Say's phoebes feed on flying insects above vernal pools.

Managed Wetlands. Managed wetlands are used on federal and state refuges to maximize habitat suitability for waterfowl and other wetland-dependent wildlife. Managed wetlands can be broadly categorized into permanent wetlands, semipermanent wetlands, seasonal wetlands, and moist soil plant areas. Most of the managed wetlands on nearby refuges are seasonal wetlands.

Permanent wetlands are flooded throughout the year, with periodic drainage to control emergent vegetation and increase productivity. Water is maintained at a depth from 2.5 to 4 feet. Dominant vegetation includes cattails, tules, and pondweeds. Semipermanent wetlands are frequently the low portions of seasonal wetlands that remain flooded after seasonal wetlands have dried or are drained. This type of wetlands management maintains exposed surface water on the site for 8 to 12 months annually and provides important summer water and brood ponds for resident waterfowl and other wildlife.

Seasonal wetlands are flooded in fall and maintained through winter or spring but are drained or allowed to dry through summer. Moist soil plant areas are seasonal wetlands managed for high production of preferred waterfowl forage plants and invertebrates. These areas may be irrigated during summer to stimulate plant growth. Water regimes are

selected for specific plant associations, including swamp timothy, watergrass, or smartweed.

Open Water. Open water in and near freshwater marshes and along rivers, oxbows, and quiet backwaters is dominated by floating and submerged aquatic species. These areas are generally unvegetated, except for occasional beds of aquatic plants. Common dominants include pondweeds, water-milfoil, waterweeds, duckweeds, bladderworts, and water lily. The open water zones of lakes and large rivers provide resting and escape cover for many species of waterfowl. Gulls, terns, kingfishers, osprey, and bald eagle hunt over open water. Insectivorous birds and bats feed over open water. Common mammals in open water include muskrat, beaver, and river otter (Mayer and Laudenslayer, 1988).

Agricultural Habitats

Many of the natural habitats in the Central Valley have been largely replaced by agricultural habitats. Six agricultural types were identified in the project area: pasture, orchard-vineyard, row crops, grain, rice, and cotton. The intensive management of agricultural lands, including disking, grazing, crop rotation, and the use of chemicals, reduces the value of these habitats for wildlife. However, many wildlife species have adapted to particular crop types and now use them for foraging and nesting. Compared to other agricultural crops, rice and grain crops are considered of high value for wildlife because waste grain is important to foraging wildlife species and flooded rice fields provide habitat similar to some natural wetlands. Compared to rice and grains, pasture and row crops provide moderate-quality habitat because of their limited cover and foraging opportunities. Orchard-vineyard and cotton crops provide low-quality wildlife habitat because of frequent disturbance that results in limited foraging opportunities and lack of cover.

Pasture. Pasture habitat consists of irrigated and unirrigated lands dominated by grasses and legumes. The vegetation composition of pastures varies with management practices, affecting the abundance and composition of wildlife. Irrigated pastures provide foraging and roosting opportunities for many shorebirds and wading birds, including black-bellied plover, killdeer, long-billed curlew, and white-faced ibis. Lightly grazed, unirrigated pastures provide forage for seed-eating birds and small mammals when the seeds ripen. Alfalfa grown in irrigated pastures provides high-quality foraging habitat for rodents. Small mammals occupying pasture habitat include California voles, Botta's pocket gophers, and California ground squirrels. Raptors, including red-tailed hawks, black-shouldered kites, and prairie falcons, prey upon rodents. Areas where alfalfa or wild oats have been recently harvested provide high-quality foraging habitat for raptors. Ground-

nesting birds, such as ring-necked pheasant, waterfowl, and western meadowlark, occupy pasture habitat if adequate residual vegetation is present.

Orchard-Vineyard. Orchard-vineyard habitat consists of cultivated fruit or nut-bearing trees and grapevines. This habitat is planted in a uniform pattern and intensively managed. Understory vegetation is usually sparse; however, in some areas, grasses are allowed to grow between vineyard rows to reduce erosion. Wildlife species associated with vineyards include the deer mouse, mourning dove, and black-tailed hare. The nut crop from orchards provides feed for American crows, scrub jay, northern flicker, Lewis' woodpecker, and California ground squirrel. The fruit crops from orchards provide additional food for yellow-billed magpies, American robin, northern mockingbird, black-headed grosbeak, gray squirrel, raccoon, and mule deer.

Row Crops. Row crops include tomatoes, sugar beets, and melons. Intensive management and the use of chemicals to control pests in row crops limit their use by wildlife. Rodent species that forage in row crops include the California vole, deer mouse, and California ground squirrel. These rodent populations are preyed on by Swainson's hawks, red-tailed hawks, and black-shouldered kites.

Grain. Grains crops include barley, wheat, corn, and oats. Many of these crops are planted in fall and harvested in spring. Grain crops are intensively managed, and chemicals are often used to control pests and diseases. This management strategy reduces their value to wildlife; however, the young green shoots of these crops provide important foraging opportunities for such species as greater white fronted geese, tundra swans, wild pigs, and tule elk. Other species, including red-winged blackbirds, Brewer's blackbirds, ring-necked pheasants, waterfowl, and western harvest mice, feed on the seeds produced by these plants.

Rice. Cultivated rice in the Central Valley has some of the attributes found in seasonal wetlands; however, the intensive management of this habitat reduces many of the benefits found in pristine wetlands. Flooded rice fields provide nesting and foraging habitat for waterfowl and shorebirds. The grain produced by this crop provides important forage for many wildlife species. After harvest, waterfowl (e.g., mallards and Canada geese), sandhill cranes, California voles, and deer mice feed upon the waste grain. Raptors, including northern harriers, black-shouldered kites, and ferruginous hawks, feed upon rodents in this habitat. Irrigation ditches used to flood rice fields often contain dense cattail vegetation and provide habitat for wildlife species, such as the Virginia rail, American bittern, snowy egret, marsh wren, common yellowthroat, and song sparrow.

Cotton. Cotton is of limited value to wildlife because of the intensive management of this crop and the use of chemicals to control pests and disease. Mourning doves and house mice are found in this crop type. During irrigation when vegetation is short and sparse, additional wildlife, including killdeer, American pipet, and horned lark, may be attracted.

SPECIAL-STATUS SPECIES

This section discusses special-status species that may occur in the project area. Two main sources were used to develop a list of threatened and endangered species that may potentially occur in the project area: the California Natural Diversity Database (CDFG, 1999) and the U.S. Fish and Wildlife Service Endangered Species Division, Sacramento, California (Appendix B).

Special-Status Fish

Several special-status fish species, including both anadromous and resident species, are found in the San Joaquin River and other streams located within the study area (Table 4.10-1). However, special-status fish species are not present in the project area.

Table 4.10-1
Special-Status Fish Species in the Project Area

Scientific/Common Name	Federal Status	State Status
<i>Lampetra hubbsi</i> /Kern brook lamprey	SC	SC
<i>Mylopharodon conocephalus</i> /Hardhead	--	SC
<i>Pogonichthys macrolepidotus</i> /Sacramento splittail	T	SC
<i>Oncorhynchus tshawytscha</i> /Chinook salmon	T	SC
<i>Oncorhynchus mykiss</i> /Steelhead trout	T	SC
<i>Oncorhynchus clarki herishawii</i> /Lahontan cutthroat trout	T	SC
<i>Oncorhynchus clarki seleniris</i> /Paiute cutthroat trout	T	SC
Source: CDFG, 1999.		
Legend: SC = species of concern; T = threatened; -- = no special-status		

Special-Status Plants

Several special-status plant species are present in the San Joaquin Valley (Table 4.10-2). Most of these species are present in the grassland vegetation, particularly vernal pools. Several special-status plant species are present in Alkali Desert Scrub habitat and two species are present in the Freshwater Emergent Wetland community. Only five of the species listed in Table 4.10-2 are or may be present in the project area. The rest of the special-status plant species are located in foothill habitats, on the eastern edge of the Central Valley, or north and south of the project area.

Table 4.10-2
Status and Habitat of Special-Status Plant Species in the Project Area

Scientific/ Common Name	Status			Habitat	Comments
	Federal	State	CNPS*		
<i>Amsinckia grandiflora</i> Large-flowered fiddleneck	FE	CE	1B	Valley grassland	Not known to be present in project area. Endemic to eastern foothills of the Diablo range.
<i>Brodiaea pallidal</i> Chinese Camp brodiaea	---	CE	1B	Valley grassland (vernal streambeds)	Not known to be present in project area. Only one occurrence in Tuolumne County.
<i>Castilleja campestris succulental</i> Succulent owl's clover	FT	CE	1B	Vernal pools	Not known to be present in project area. Endemic to eastern edge of the central San Joaquin Valley.
<i>Caulanthus californicus</i> California jewelflower	FE	CE	1B	Valley grassland and alkali desert scrub	Not known to be present in project area. Endemic to southern San Joaquin Valley.
<i>Chamaesyce hooverii</i> Hoover's spurge	FT	---	1B	Vernal pools	Not known to be present in project area. Endemic to eastern Sacramento and San Joaquin Valleys.
<i>Cordylanthus mollis mollis</i> Soft birds-beak	PE	CR	1B	Marshes and swamps	Present on San Luis National Wildlife Refuge.
<i>Cordylanthus palmatus</i> Palmate-bracted bird's-beak	FE	CE	1B	Valley grassland and alkali desert scrub	Potentially present in southern portion of study area.
<i>Eriastrum hooverii</i> Hoover's eriastrum	FT	---	4	Valley grassland and alkali desert scrub	Known populations south of study area
<i>Eryngium racemosum</i> Delta button-celery	---	CE	1B	Valley grassland (riparian scrub)	Present in San Luis and Merced National Wildlife Refuges.
<i>Gratiola heterosepalal</i> Boggs Lake hedge-hyssop	---	CE	1B	Valley grassland and freshwater emergent wetland	Not known to be present in Project area. Endemic to eastern Sacramento and San Joaquin Valleys.
<i>Lasthenia conjugens</i> Contra Costa goldfields	PE	---	1B	Valley grassland (vernal pools)	Not known to be present in project area. Known to occur only at a few locations in Solano and Napa Counties.
<i>Lembertia congdonii</i> San Joaquin woollythreads	FE	---	1B	Valley grassland and alkali desert scrub	Potentially present in southern portion of study area.
<i>Lilaeopsis masonii</i> Mason's liaeopsis	---	CR	1B	Valley riparian and freshwater emergent wetland	Not known to be present in project area. Range north of study area.
<i>Neostapfia colusana</i> Colusa grass	FT	CE	1B	Valley grassland (vernal pools)	Present in the San Joaquin River National Wildlife Refuge.
<i>Orcuttia inaequalis</i> San Joaquin Valley Orcutt grass	FT	CE	1B	Valley grassland (vernal pools)	Not known to be present in project area. Endemic to eastern San Joaquin Valley.
<i>Orcuttia pilosal</i> Hairy Orcutt grass	FE	CE	1B	Valley grassland (vernal pools)	Endemic to eastern Sacramento and San Joaquin Valleys.
<i>Orcuttia tenuis</i> Slender Orcutt grass	FT	CE	1B	Valley grassland (vernal pools)	Not known to be present in project area. Range north of study area.
<i>Orcuttia viscidal</i> Sacramento Orcutt grass	FE	CE	1B	Valley grassland (vernal pools)	Not known to be present in project area. Endemic to Sacramento Valley.
<i>Pseudobahia bahiifolia</i> Hartweg's golden sunburst	FE	CE	1B	Valley grassland	Not known to be present in project area. Distribution limited to eastern side of San Joaquin Valley in Stanislaus County.
<i>Pseudobahia peirsonii</i> San Joaquin adobe sunburst	FT	CE	1B	Valley grassland	Not known to be present in project area. Endemic to eastern San Joaquin Valley.
<i>Sanicula saxatilis</i> Rock sanicle	---	CR	1B	Valley grassland	Not known to be present in project area. Endemic to Santa Clara and Contra Costa Counties.

Table 4.10-2
Status and Habitat of Special-Status Plant Species in the Project Area

Scientific/ Common Name	Status			Habitat	Comments
	Federal	State	CNPS*		
<i>Sidalcea keckii</i> Keck's checkerbloom	C	---	1B	Valley grassland	Not known to be present in project area. Endemic to southern Sierra Nevada foothills.
<i>Trifolium amoenum</i> Showy Indian clover	PE	---	1B	Valley grassland	Not known to be present in project area. One known occurrence in Sonoma County.
<i>Tuctoria greenei</i> Greene's tuctoria	FE	CR	1B	Valley grassland (vernal pools)	Not known to be present in project area. Currently present in eastern Merced County.
<i>Tuctoria mucronata</i> Crampton's tuctoria	FE	CE	1B	Valley grassland (vernal pools)	Not known to be present in project area. Currently present in Solano County.
<i>Verbena californica</i> California vervain	PT	---	1B	Valley grassland	Not known to be present in project area. Currently present in Tuolumne County.

*California Native Plant Society

- Federal: FE = listed as endangered under the federal Endangered Species Act.
 FT = listed as threatened under the federal Endangered Species Act.
 PE = proposed for federal listing as endangered under the federal Endangered Species Act.
 PT = proposed for federal listing as threatened under the federal Endangered Species Act.
 C = candidate for federal listing.
 -- = none of the above.
- State: CE = listed as endangered under the California Endangered Species Act.
 CT = listed as threatened under the California Endangered Species Act.
 CR = listed as rare under the California Endangered Species Act. This category is no longer used for newly listed plants, but some plants previously listed as rare retain this designation.
 -- = none of the above.
- CNPS: 1B = List 1B species: rare, threatened, or endangered in California and elsewhere.
 4 = List 4 species: plants of limited distribution.

Soft Bird's-Beak. Soft bird's-beak is an annual herb endemic to the northern shores of the San Francisco Bay. A dozen historical occurrences were known from Marin to Contra Costa Counties, where the counties border San Francisco Bay. Investigations in the San Joaquin Valley in the early 1990s detected soft birds-beak in the San Luis National Wildlife Refuge (Service, 2000a). Soft bird's-beak occurs in coastal salt marshes; however, specifics about the microhabitat requirements of the species are not known. Reasons for historical declines are probably related to urban development and pollution, coupled with the relative sensitivity of the species to changes in environmental conditions as evidenced by the extreme fluctuations in annual population size (Reclamation, 1997a).

Palmate-Bracted Bird's-Beak. Palmate-bracted bird's-beak is an annual herb endemic to moist lowlands in the Central and Livermore Valleys. Its original range was probably similar to its current range, but with more numerous populations. Today it occurs at the Delevan and Colusa National Wildlife Refuges, near the City of Woodland, in the Springtown alkali sink north of Livermore, in western Madera County, at Sacramento National Wildlife Refuge in Glenn County, and at the Alkali Sink Ecological Reserve in Fresno County adjacent to the Mendota Wildlife Management Area. Palmate-bracted

bird's-beak is restricted to saline-alkali soils in relatively undisturbed, seasonally flooded, alkali sink scrub habitats, at elevations below 500 feet. Habitat for the species has been eliminated and degraded by conversion to agricultural and urban development, draining of seasonal wetlands, grazing, off-road vehicle use, and trash dumping.

Delta Button-Celery. Delta button-celery is an annual or perennial herb found in streamside thickets dominated by one or more willow species, as well as by other fast-growing shrubs and vines. Most plants colonize vernal mesic clay depressions following flood disturbance. Their life form is variable depending on environmental conditions. Today, its distribution is restricted to a small number of occurrences in Merced County and is threatened by agriculture and flood control. Delta button-celery is present in the project area on the Los Banos Wildlife Management Area.

San Joaquin Woolly-Threads. San Joaquin woolly-threads is an annual herb endemic to the southern San Joaquin Valley and surrounding hills. It grows in annual grasslands with sparse cover of saltbush on alluvial fans, often with sandy soil. Its original range extended from southern Fresno and Tulare Counties (excluding the Tulare Lake bed) to Bakersfield and Cuyama Valley. Existing populations are scattered throughout all but the eastern portion of this area. Most of the 20 existing populations are in the area of the Carrizo Plain. Throughout its range, most of its habitat has been eliminated by conversion to agriculture. Threats to remaining unprotected populations include heavy grazing (especially by sheep), oil field development, and possibly air pollution.

Colusa Grass. Colusa grass is endemic to the Sacramento and San Joaquin Valleys. Its historical distribution included Merced, Stanislaus, Solano, and Colusa Counties. Colusa grass is known to be present on the San Joaquin River National Wildlife Refuge and thought to be present on the San Luis National Wildlife Refuge (Service, 2000a). Colusa grass occurs in large or deep vernal pools with substrates of adobe mud. The primary reasons for decline in this species include the conversion of vernal pools to agricultural and developed lands, heavy grazing by cattle, and competition from introduced weedy species that tend to displace Colusa grass (Reclamation, 1997a).

Special-Status Wildlife

Because a large number of special-status wildlife species with state or federal status may occur in the San Joaquin Valley, a core list of special-status wildlife was selected for this study. Threatened, endangered, proposed, or candidate species with known occurrences in the project area and with the greatest potential to occur in the project area based on available habitat were included in this study. This core list of wildlife species, including common and scientific name, federal and state status, associated habitat, and breeding

period, is presented in Table 4.10-3. Additional information on distribution, habitat, and life history for these species can be found in the CVPIA Draft PEIS (Reclamation, 1997a). Information on special-status species high-priority needs within the CVP is included as Attachment H to the CVPIA Draft PEIS.

Table 4.10-3
Status and Habitat of Special-Status Wildlife Species
Potentially Occurring in the Project Area

Common Name/ Scientific Name	Status Federal/State	Habitat/Comments
Invertebrates		
Valley elderberry longhorn beetle <i>Desmocerus californicus dimorphus</i>	T/--	Completely dependent on its host plant, elderberry (<i>Sambucus</i> spp.), a common component of riparian forests, grasslands, and adjacent foothills of the Central Valley up to 3,000 feet. Adults are present from March through early June with peak activity in May.
Crustaceans		
Longhorn fairy shrimp <i>Branchinecta longiantenna</i>	E/--	Vernal pools. Species detected in spring and early summer while suitable habitats contain water.
Vernal pool fairy shrimp <i>Branchinecta lynchi</i>	T/--	Endemic to the grasslands of the Central Valley and Central and South Coast Mountains. Inhabit small, clearwater sandstone-depression pools and grassy swales, earth slump, or basalt-flow depression pools. Detected in spring and early summer when suitable habitats contain water.
Amphibians		
California tiger salamander <i>Ambystoma californiense</i>	C/CSC	Prime habitat in California is annual grassland, but seasonal ponds or vernal pools are crucial to breeding. Permanent ponds or reservoirs are sometimes used.
California red-legged frog <i>Rana aurora draytonii</i>	T/CSC	Permanent pools of streams, marshes, or ponds with emergent or submerged vegetation. Breeds January to July.
Reptiles		
Blunt-nosed leopard lizard <i>Gambelia (=Crotaphytus) silus</i>	E/E	Suitable habitat is characterized by sparsely vegetated scrub and grassland habitats in areas of low topographic relief. In areas of high relief, distribution is usually confined to broad sandy washes.
Giant garter snake <i>Thamnophis gigas</i>	T/T	Primarily associated with marshes and sloughs, less with slow-moving creeks, and absent from larger rivers. Active from mid-March until October.
Birds		
Aleutian Canada goose <i>Branta canadensis leucopareia</i>	T/--	In winter, forages in fields in and near safe roosting areas on open water of lakes and ponds. Does not breed in California.

Table 4.10-3
Status and Habitat of Special-Status Wildlife Species
Potentially Occurring in the Project Area

Common Name/ Scientific Name	Status Federal/State	Habitat/Comments
White-tailed kite <i>Elanus leucurus</i>	--/P	Forages in open grasslands, meadows, farmlands, and emergent wetlands. Nests from May to August in oak, willow, or other tree stands.
Swainson's hawk <i>Buteo swainsoni</i>	--/T	Riparian areas and oak savannah with few trees. Breeds late March to mid-August.
Mammals		
San Joaquin Valley woodrat <i>Neotoma fuscipes riparia</i>	PE/--	Prefers riparian forest habitats with moderate canopy, year-round greenery, a brushy understory, and suitable nest-building materials. Houses are built of sticks and leaves at the base of or in a tree or around a shrub.
Riparian brush rabbit <i>Sylvilagus bachmani riparius</i>	PE/E	Dense brush cover of thickets, vines, brambles, or dense riparian species form the center of the brush rabbit life. Blackberry and willow patches are favored covers.
San Joaquin kit fox <i>Vulpes macrotis mutica</i>	E/T	Lives in annual grasslands or grassy open stages of vegetation dominated by scattered shrubs and scrub.
Giant kangaroo rat <i>Dipodomys ingens</i>	E/E	Found on fine sandy loam soils supporting sparse annual grass/forb vegetation, and marginally found in low-density alkali desert scrub.
Tipton kangaroo rat <i>Dipodomys nitratoideis nitratoideis</i>	E/E	Suitable habitat has widely scattered shrubs, annual forbs and grasses, and is distributed over broken terrain with small gullies and washes.
Fresno kangaroo rat <i>Dipodomys nitratoideis exilis</i>	E/E	Gently undulating to level terrain with sandy loam soils, mildly to moderately alkaline, and herbaceous vegetation with scattered shrubs, appears to be suitable habitat.
San Joaquin antelope squirrel <i>Ammospermophilus nelsoni</i>	--/T	Prefers open areas in arid and semi-arid habitats; requires friable soil for burrowing. Uses hard-surfaced, rocky, or gravelly soils in open areas with clumps of shrubs.
T = Threatened E = Endangered PE = Proposed endangered C = Candidate to become a proposed species SOC = Federal Species of Concern CSC = California Species of Special Concern. P = State Protected species.		

AREAS AFFECTED BY USE OF CVP WATER

All 20 of the contractors in the project area and several Significant Natural Areas use CVP water. The individual contractors, including all of the water districts and irrigation

districts, the City of Tracy, and Reclamation District #1606, are described in Section 4.1. The following sections of the report describe several of the larger Significant Natural Areas affected by CVP water.

Significant Natural Areas

The 77 Significant Natural Areas in the San Joaquin Valley are scattered throughout the region, but are concentrated in the grasslands of the San Joaquin Valley in freshwater marsh, valley sink scrub, and grassland vernal pool habitats. These areas are important to waterfowl and shorebirds that winter and nest in the San Joaquin Valley, as well as for several special-status species, including the giant garter snake, Swainson's hawk, tricolored blackbird, Colusa grass, Delta button celery, San Joaquin woollythreads, and soft birds-beak. In the southwestern portion of the valley, several Significant Natural Areas support special-status species (e.g., the giant kangaroo rat, blunt-nosed leopard lizard, Swainson's hawk, and San Joaquin antelope squirrel) and habitats (e.g., valley needlegrass grassland and northern vernal pool habitats).

Historically, the San Joaquin basin was a large floodplain of the San Joaquin River that supported vast expanses of permanent and seasonal marshes, lakes, and riparian areas. Almost 70 percent of the basin has been converted to irrigated agriculture, with wetland acreage reduced to 120,300 acres. In combination with the adjacent uplands, the wetland complex is referred to as "the Grasslands" and consists of 160,000 acres of private and public lands. Approximately 53,300 acres of the Grasslands are permanently protected in state or federal wildlife refuges or in federal conservation easements.

Several Significant Natural Areas are present in the project area or are located nearby. Significant Natural Areas present in the project area include the Lower Cottonwood, Mendota, O'Neill Forebay, and Upper Cottonwood Creek Wildlife Management Areas. Significant Natural Areas present in the near vicinity of the Project area include Los Banos Wildlife Management Area, Little Panoche Wildlife Management Area, Merced National Wildlife Refuge, North Grasslands Wildlife Management Area, San Joaquin River National Wildlife Refuge, San Luis National Wildlife Refuge, and Volta Wildlife Management Area.

Los Banos Wildlife Management Area. The Los Banos Wildlife Management Area was the first waterfowl refuge established in California (Reclamation, 1997a). The refuge encompasses approximately 5,586 acres of the San Joaquin River floodplain and is located approximately 10 miles east of the Centinella Water District. It maintains approximately 3,200 acres of seasonal and permanent wetlands and 213 acres of alkali sink habitat. The Los Banos Wildlife Management Area provides habitat for a variety of bird species,

including ducks, geese, shorebirds, coots, wading birds, and cranes. Pintail ducks and lesser snow geese are the most common waterfowl on the refuge. Swainson's hawks are known to nest near the refuge and to use the refuge for foraging. Other special-status species known to occur on the refuge include the giant garter snake and delta button celery.

Mendota Wildlife Management Area. The 12,425-acre Mendota Wildlife Management Area is the largest publicly-owned and managed wetland in the San Joaquin Valley (Reclamation, 1997a). Established between 1954 and 1966, the refuge is located on a part of the Coelho Family Trust and is adjacent to the Fresno Slough Water District, the Mardelia Hughes property, Reclamation District #1606, Tranquillity Irrigation District, and the 900-acre Alkali Sink Ecological Reserve. Approximately 8,300 acres of wetlands are maintained on the refuge, including almost 6,800 acres of seasonal wetlands. The water used to maintain these seasonal wetlands is purchased directly from the CVP (Huddleson, 2000). Migratory ducks and shorebirds utilize the seasonal wetland habitat present on the Mendota Wildlife Management Area. To feed these animals, several crops, including corn, barley, milo, and safflower, are raised. Giant garter snakes have been observed on the refuge.

Merced National Wildlife Refuge. The Merced National Wildlife Refuge was established in 1951 to alleviate crop depredation and provide waterfowl habitat (Reclamation, 1997a). The 2,562-acre refuge is one of the most important wintering areas in California, supporting snow and Ross' geese, sandhill cranes, and variety of shorebirds. Delta button-celery, a state candidate endangered species, is also present on the refuge. The refuge maintains approximately 1,232 acres of wetlands, of which approximately 730 acres are in moist soil plant management. A total of 550 acres is in cereal grain production, primarily alfalfa and corn. The Merced National Wildlife Refuge is located approximately 13 miles east of the Del Puerto Water District.

North Grasslands Wildlife Management Area. The North Grasslands Wildlife Management Area was purchased by the State of California in April 1990 and is managed by the California Department of Fish and Game (Reclamation, 1997a). It is located within five miles of the Del Puerto Water District and includes three separate units. The China Island and Salt Slough units contain 5,556 acres of primarily agricultural land and pasture, but also have extensive river and slough channels with riparian edges. These two units receive water directly from the CVP (Wilbur, 2000); however, the Salt Slough unit does not have a firm historical water supply. North Grasslands Wildlife Management Area provides habitat for a variety of wildlife species. Ducks are the most common waterbirds using the refuge, but sandhill cranes, shorebirds, and geese, including the Aleutian Canada

goose, are also common. Agricultural crops irrigated with water from the Delta-Mendota Canal feed wintering migratory birds.

San Luis National Wildlife Refuge. The 7,340-acre San Luis National Wildlife Refuge is located approximately six miles east of the Del Puerto Water District. The refuge is a complex of wetland, upland, and riparian habitat, with approximately 2,700 acres of wetlands managed for moist soil plant production (Reclamation, 1997a). Of the 3,940 acres of grasslands, 145 acres of native grassland are preserved as a rare ecological community. The San Luis National Wildlife Refuge buys water from the CVP to irrigate seasonal wetlands and cereal crops (Chouinard, 2000). The refuge provides habitat for waterfowl, including ducks, geese, and shorebirds, as well as tule elk and other endangered species. Soft birds-beak, a federal proposed endangered plant species, and delta button-celery are both present on the San Luis National Wildlife Refuge.

San Joaquin National Wildlife Refuge. The San Joaquin National Wildlife Refuge is located approximately 10 miles west of Modesto on Highway 132 and the San Joaquin River. No public access currently exists. The refuge consists of approximately 800 acres of San Joaquin River riparian habitat. Primary wildlife at the refuge includes the endangered Aleutian Canada goose, as well as ducks, sandhill cranes, migratory nongame songbirds, and colonial nesting birds.

Volta Wildlife Management Area. The 3,000-acre Volta Wildlife Management Area is located approximately five miles east of the Centenella Water District. The refuge maintains more than 1,800 acres of wetlands, including 1,400 acres of moist soil plants, and 720 acres of alkali sink habitat are preserved on the refuge as a rare ecological community (Reclamation, 1997a). The Volta Wildlife Management Area provides habitat for a variety of bird species, including ducks, geese, shorebirds, coots, and wading birds. Black-necked stilts, sandpipers, dunlins, and dowitchers dominate shorebird species.

AREAS NOT AFFECTED BY USE OF CVP WATER

Four natural areas in the vicinity of the project area that are managed as uplands do not receive water from the Delta-Mendota Canal (Wilbur, 2000). These areas include the Little Panoche, Lower Cottonwood Creek, O'Neill Forebay, and Upper Cottonwood Creek Wildlife Management Areas. Upper and Lower Cottonwood Creek Wildlife Management Areas are located adjacent to San Luis Reservoir. O'Neill Forebay Wildlife Management Area is located adjacent to its namesake. The Little Panoche Wildlife Management Area is located on Little Panoche Creek in the hills approximately 10 miles southwest of the Eagle Field Water District.

EXISTING GENERAL PLAN PROTECTIVE AND MANAGEMENT MEASURES

In addition to the measures required under the Endangered Species Act to protect listed and proposed species, other measures to mitigate or offset impacts to sensitive and special-status species have been developed and implemented by the cities and counties in the project area as part of their general plans. Some of these goals and policies are currently being reviewed and modified by city and county agencies as part of the general plan EIR process. The most current measures for the affected cities and counties in the project area are described below.

Stanislaus County

The Conservation/Open Space Element of the Stanislaus County General Plan support documentation emphasizes the conservation and management of economically productive natural resources and conservation of open space lands (any parcel or area of land or water that is essentially unimproved). The element (1) promotes the protection, maintenance, and use of the county's natural resources, with special emphasis on scarce resources and those that require special control and management; (2) prevents wasteful exploitation, destruction, and neglect of natural resources; (3) recognizes the need for natural resources to be maintained for their ecological values as well as for their direct benefit to people; (4) preserves open space lands for outdoor recreation including scenic, historic, and cultural areas; and (5) preserves open space for public health and safety, including areas subject to landslides, flooding, and high fire risk, and areas required for the protection of water and air quality.

Goal One encourages the protection and preservation of natural and scenic areas throughout the county by:

- Maintaining the natural environment in areas dedicated as parks and open space
- Ensuring compatibility between natural areas and development
- Protecting from development areas of sensitive wildlife habitat and plant life (e.g., vernal pools, riparian habitats, flyways, and other waterfowl habitats, etc.) including those habitats and plant species listed in the General Plan Support Documentation or by state or federal agencies
- Protecting and enhancing oak woodlands and other native hardwood habitat

San Joaquin County

Implementing the Natural Resources Regulations as identified in the Draft General Plan 2010 would protect important biotic resources within San Joaquin County. The county's policies and implementation measures related to the protection and management of biological resources include special-status species, sensitive natural communities, and fisheries.

The Final EIR on the San Joaquin County Comprehensive Planning Program (Baseline, 1992) recommends that the county develop an integrated vegetation management program for properties owned and maintained by the county. Additionally, the Final EIR recommends protecting habitat areas large enough to be minimally affected by urban development including maintaining connection of habitat and restoring and enhancing degraded ecosystems such as historic salmon runs on the Mokelumne and Calaveras Rivers.

City of Tracy

The City of Tracy plans to conserve natural resources through the protection and enhancement of permanently preserved open space. For actions associated with the policies listed below, refer to *City of Tracy General Plan: An Urban Management Plan* (City of Tracy, 1993).

The City of Tracy recognizes Old River, Tom Paine Slough, and Paradise Cut as important open space resources for habitat conservation and recreational opportunities. It also will minimize impacts of development on waterways, riparian corridors, and adjacent buffer areas and will seek opportunities to preserve or establish wildlife habitat, in conjunction with other uses and developments within the Tracy Urban Management Plan Area.

Fresno County

Policies in the Fresno County General Plan seek to protect riparian and wetland habitats while allowing compatible uses where appropriate. Related policies are included in Section LU-C, River Influence Areas; Section OS-A, Water Resources; Section OS-E, Fish and Wildlife Habitat; and Section OS-F, Vegetation.

- To conserve the function and values of wetland communities and related riparian areas throughout Fresno County while allowing compatible uses where appropriate. Protection of these resource functions positively affect aesthetics, water quality, floodplain management, ecological function, and recreation/tourism. Policies in this section seek to protect natural areas and to preserve the diversity of habitat in the

county. Related policies are included in Water Resources, Forest Resources, Wetland and Riparian Areas, Vegetation, and River Influence Areas elements.

- To help protect, restore, and enhance habitats in Fresno County that support fish and wildlife species so that populations are maintained at viable levels. Policies in this section seek to protect native vegetation resources primarily on private land within the county.
- To preserve and protect the valuable vegetation resources of Fresno County.

For more detailed information on the direction of the goals listed below, refer to the Fresno County General Plan Background Report (County of Fresno, 2000a).

City of Fresno

Currently, the City of Fresno has three main objectives for conservation of natural resources (City of Fresno, 2000).

- To provide for long-term preservation, enhancement, and enjoyment of plant, wildlife, and aquatic habitat resources in the Fresno area by protecting, improving, and restoring these resources.
- Maintain and restore, where feasible, the ecological values of the San Joaquin River corridor, because (1) this area is Fresno's main scenic feature and natural area; (2) it is important for maintenance of good-quality water resources in the region; and (3) it constitutes unique, irreplaceable habitat for valley native species.
- Support the San Joaquin River Conservancy in its efforts to develop a river parkway that strikes an appropriate balance between facilitating recreational pursuits; protecting water resources; meeting economic and development needs through sand and gravel production; and long-term preservation, enhancement, and public enjoyment of the river's unique and irreplaceable plant, wildlife, and aquatic resources.

For more information on the policies associated with these objectives, refer to the Draft 2000 Fresno General Plan (City of Fresno, 2000).

Merced County

Merced County has the following goals and objectives regarding conservation of natural resources.

- Habitats that support rare, endangered, or threatened species are not substantially degraded. Rare and endangered species are protected from urban development and are recognized in rural areas.
- Local, state, and federal managed lands are recognized.

For more information on the policies developed for these goals and objectives, refer to the Merced County Year 2000 General Plan (Merced County, 1990a).

ENVIRONMENTAL CONSEQUENCES

Impacts to biological resources would be considered adverse if special-status species or their habitats, as designated by federal, state, or local agencies, were affected directly or indirectly by project-related activities. In addition, impacts to biological resources would be considered significant if substantial loss, reduction, degradation, disturbance, or fragmentation occurred in native species habitats or in their populations. These impacts could be short- or long-term impacts. For example, short-term or temporary impacts may occur during project implementation, and long-term impacts may result from the loss or change of vegetation and thereby loss of the capacity of habitats to support wildlife populations.

NO-ACTION ALTERNATIVE

Requirements of the CVPIA Biological Opinion being prepared (Reclamation and Service, 2000) would be met under the No-Action Alternative, including continuation of ongoing conservation programs for special-status species. The renewal of long-term contracts would not involve construction of new facilities or installation of structures that would alter current land uses. The renewal of CVP contracts for the project area would only continue water deliveries that accommodate the land uses identified in Section 4.4. Implementation of the No-Action Alternative would not impact the production of agricultural crops or existing land uses. No habitat that supports special-status species would be converted to agricultural, municipal, or industrial use. As a result, renewal of the water service contracts under the No-Action Alternative would not result in adverse effects on fish, vegetation, or wildlife resources located in the Delta-Mendota Canal Unit.

ALTERNATIVE 1

Similar to the discussion above for the No-Action Alternative, Alternative 1 would not result in adverse impacts on biological resources, including fish, vegetation, and wildlife, in the Delta-Mendota Canal Unit project area. The renewal of CVP contracts for the project area would only continue water deliveries that accommodate the land uses

identified in Section 4.4. Implementation of Alternative 1 would not substantially impact the production of agricultural crops or existing land uses. No habitat that supports special-status species would be converted to agricultural, municipal, or industrial use.

ALTERNATIVE 2

Similar to the discussion above for the No-Action Alternative, Alternative 2 would not result in adverse impacts on biological resources, including fish, vegetation, and wildlife, in the Delta-Mendota Canal Unit project area. The renewal of CVP contracts for the project area would only continue water deliveries that accommodate the land uses identified in Section 4.4. Implementation of Alternative 2 would not substantially impact the production of agricultural crops or existing land uses. No habitat that supports special-status species would be converted to agricultural, municipal, or industrial use.

CUMULATIVE IMPACTS

Cumulative impacts on a CVP-wide basis are addressed in the CVPIA PEIS. Beyond those cumulative impacts, there are no additional impacts attributable to Alternative 1 or 2 that would contribute to cumulative biological impacts.